Journal of Cardiovascular Disease Research
ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 12, 2024

"Galectin-3: Insights Into Type 2 Diabetes Mellitus"

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ABSTRACT

Type 2 Diabetes Mellitus (T2DM) significantly contributes to cardiovascular disease (CVD) morbidity and mortality. This study examines the CVD risk among 276 T2DM patients using biomarker Galectin-3, along with clinical factors such as HbA1C levels, smoking, and alcohol consumption. The findings highlight the prevalence of moderate-to-high cardiovascular risk in this population, underscoring the need for targeted interventions**.**

Keywords: Type 2 Diabetes Mellitus, Cardiovascular Disease, Galectin-3, CVD Risk

INTRODUCTION

T2DM affects 8.3% of adults globally, with complications such as cardiovascular disease (CVD) being a leading cause of mortality.[1] T2DM is critical, if it is left untreated or with no proper care it can lead to many adverse macro and micro vascular complications. [2]Traditional Cardio Vascular risk factors (obesity, hypertension, smoking and dislipidemia) are present from the early stage of Prediabetes in T2DM patients and are found to have an association with CV death in diabetic population.[3-4]Traditional risk factors such as obesity, smoking, and hypertension, combined with biomarker Galectin-3, help identify patients at risk of CVD. This study evaluates the distribution of CVD risk scores among T2DM patients, emphasizing the importance of early detection and management.[5]

OBJECTIVE –

1. To measure Galectin-3 Levels and assess the association with CVD Risk in T2DM.
2. To find out the correlation between conventional markers in T2DM patients and Galectin-3

METHODOLOY-

This study was conducted in the Department of Biochemistry in association with the Department of General Medicine of SMS Medical College and Hospital Jaipur, Patients diagnosed for type 2 diabetes mellitus, visiting the outpatient department (OPD) of medicine fulfilling the inclusion criteria were enrolled for the study. 276 patients taken for the study. The serum concentrations of Galectin-3 were determined by ELISA method. The variables were analyzed on SPSS software version 16 and P≤0.05 was considered as significant.

A cross-sectional study involving 276 T2DM patients (125 males, 151 females) was conducted. Data on Galectin-3, HbA1C levels, smoking, and alcohol consumption were collected.

OBSERVATIONS

Age1		BMI	HBA1C (%)	DURATION OF DIABETES (Years)	GALECTIN-3 (ng/mL)
<31	N	7	7	7	7
	Mean	26.81	7.74	3.41	2.96
	Std. Deviation	5.17	0.77	4.65	3.00
31-50	N	73	73	73	73
	Mean	27.50	8.30	5.27	4.78
	Std. Deviation	4.55	1.28	5.09	4.99
51-70	N	174	174	174	174
	Mean	27.27	8.06	8.26	6.54
	Std. Deviation	5.19	1.52	5.93	4.82
>70	N	22	22	22	22
	Mean	24.81	8.41	9.18	7.50
	Std. Deviation	4.77	1.66	6.22	3.85
Total	N	276	276	276	276
	Mean	27.12	8.14	7.42	6.06
	Std. Deviation	5.02	1.46	5.88	4.84
		0.1556	**0.4528**	**0.0003**	**0.0081**

Table 2. COMPARISON OF BMI,SYOSTOLIC BLOOD PRESSURE ,DIASTOLIC BLOOD PRESSURE,HBA1C, & GAL-3 IN MALE AND FEMALE PATIENTS

SEX		BMI	SYSTOLIC BP (MMHG)	DIASTOLIC BP (MMHG)	HBA1C (%)	GAL-3 (ng/mL)
Male	N	125	125	125	125	125
	Mean	24.41	133.46	83.17	8.25	6.67
	Std. Deviation	3.33	20.54	8.00	1.66	5.07
Female	N	151	151	151	151	151
	Mean	29.36	136.23	82.97	8.06	5.56
	Std. Deviation	5.09	17.45	8.61	1.27	4.60
Total	N	276	276	276	276	276
	Mean	27.12	134.97	83.06	8.14	6.06
	Std. Deviation	5.02	18.93	8.33	1.46	4.84
P Value		**0.0000**	**0.2259**	**0.8473**	**0.2931**	**0.0583**

Table 3 . COMPARISON OF GAL-3 IN SMOKERS AND NON SMOKERS

SMOKING		GAL-3 (ng/mL)
No	N	217
	Mean	5.93
	Std. Deviation	4.87
Yes	N	59
	Mean	6.57
	Std. Deviation	4.75
Total	N	276
	Mean	6.06
	Std. Deviation	4.84
P Value		**0.3700**

Table 4. Comparison of GAL-3 in Alcoholic and non-Alcoholic patients

ALCOHOL		GAL-3 (ng/mL)
No	N	249
	Mean	5.89
	Std. Deviation	4.82
Yes	N	27
	Mean	7.67
	Std. Deviation	4.84
Total	N	276
	Mean	6.06
	Std. Deviation	4.84
P Value		**0.0690**

Table5. Comparison of GAL-3 in patients with edema and without edem

EDEMA		GAL-3 (ng/mL)
No	N	178
	Mean	6.00
	Std. Deviation	5.25
Yes	N	98
	Mean	6.17
	Std. Deviation	4.02
Total	N	276
	Mean	6.06
	Std. Deviation	4.84
P Value		**0.7771**

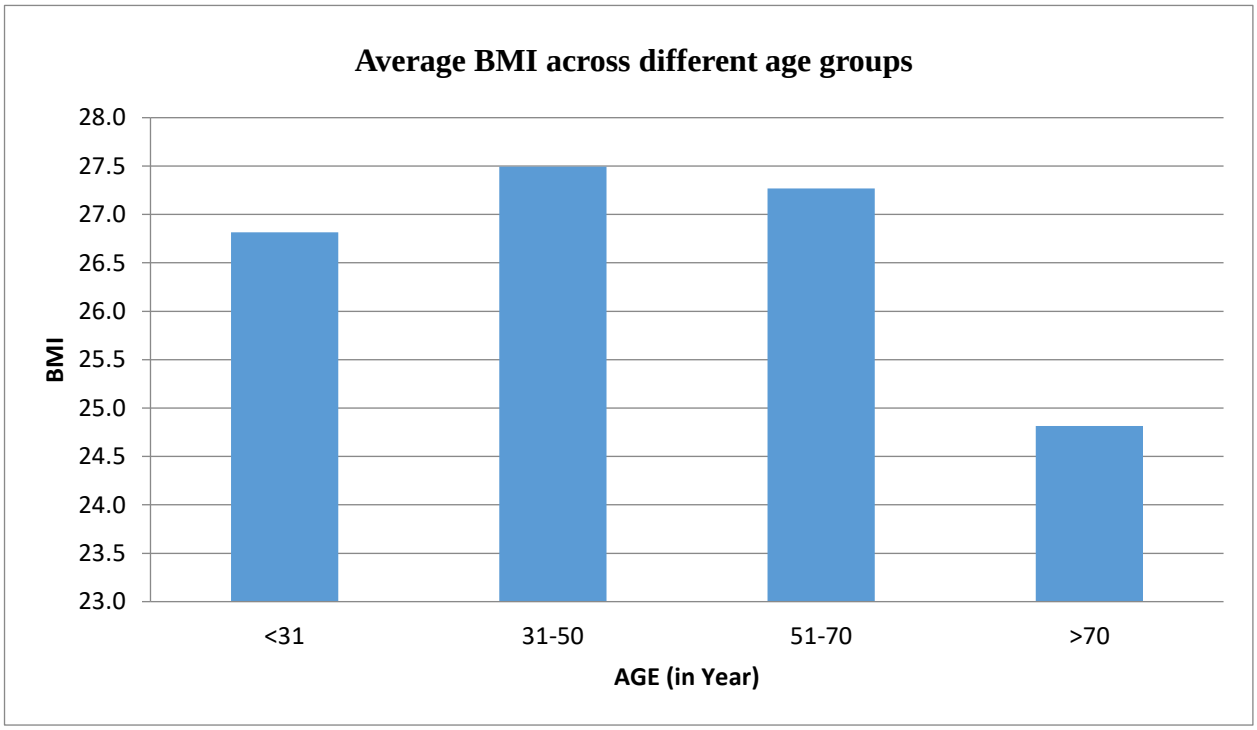

Fig. 1Average BMI across different age groups

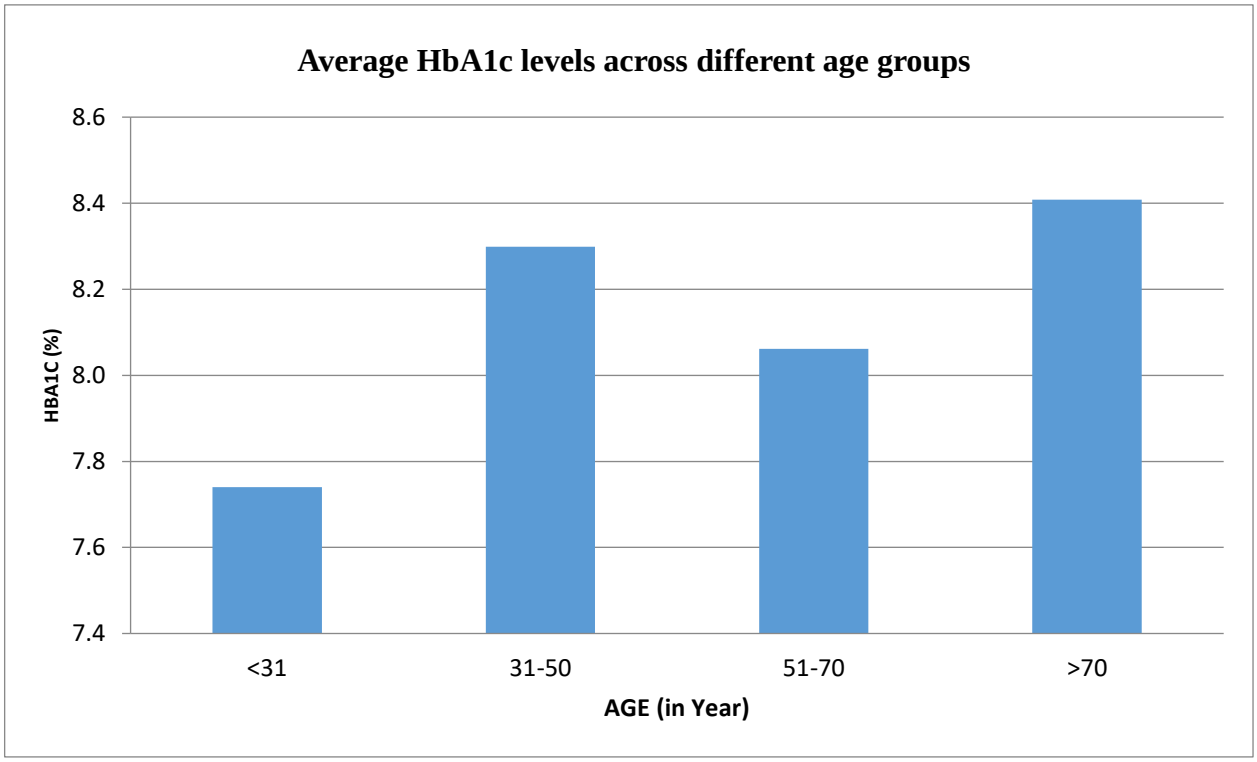

Fig.2 Average HbA1c levels across different age groups

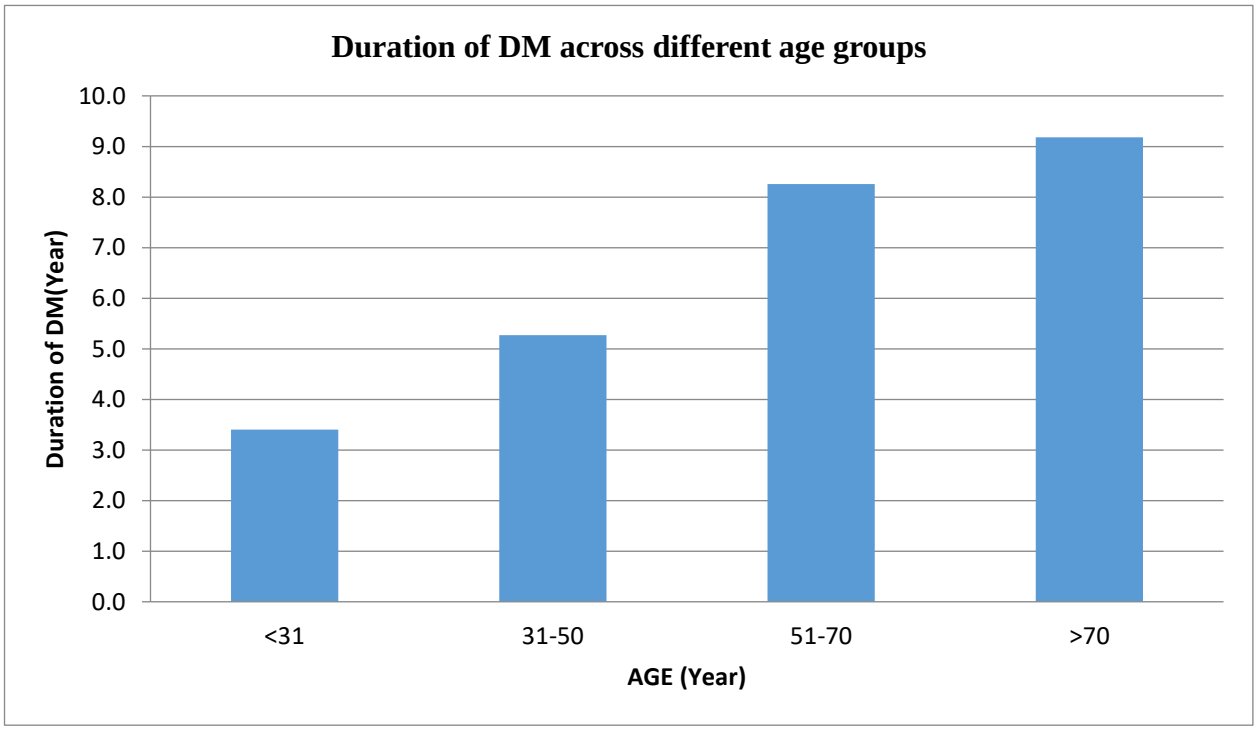

Fig.3Duration of DM across different age groups

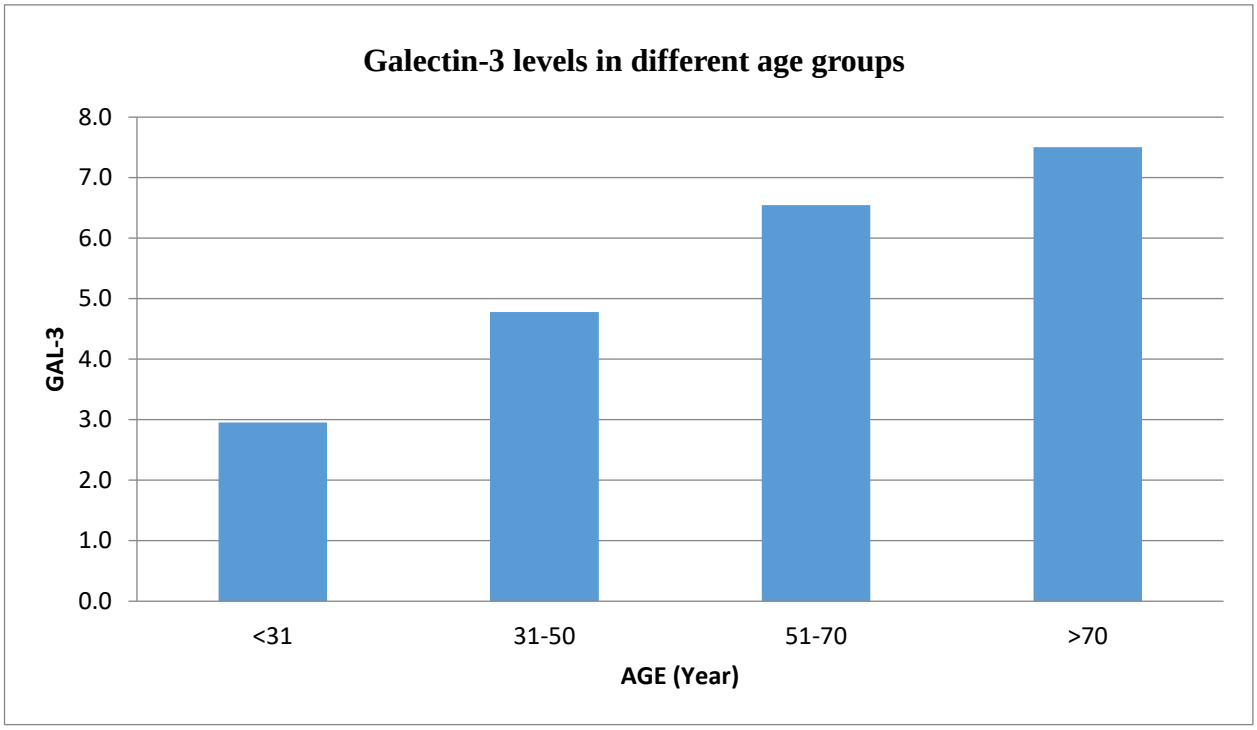

Fig.4 Galectin-3 levels in different age groups

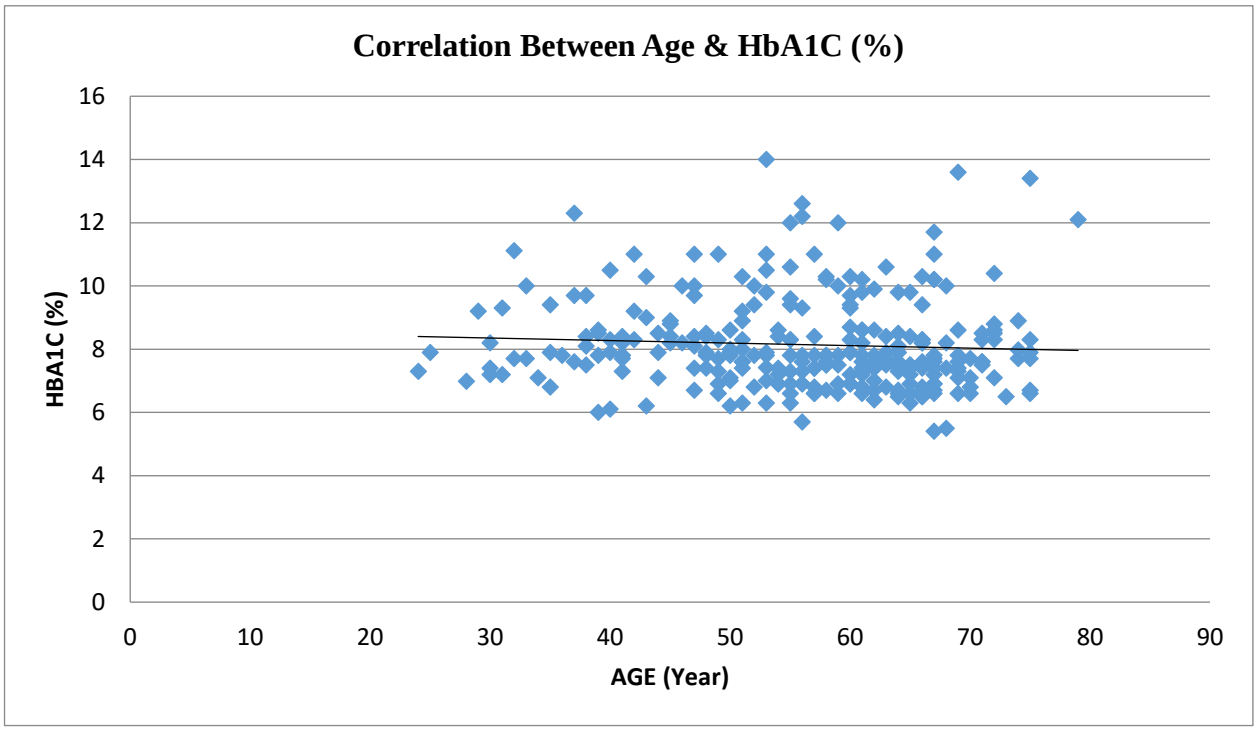

Fig.5 Correlation Between Age & HbA1C (%)

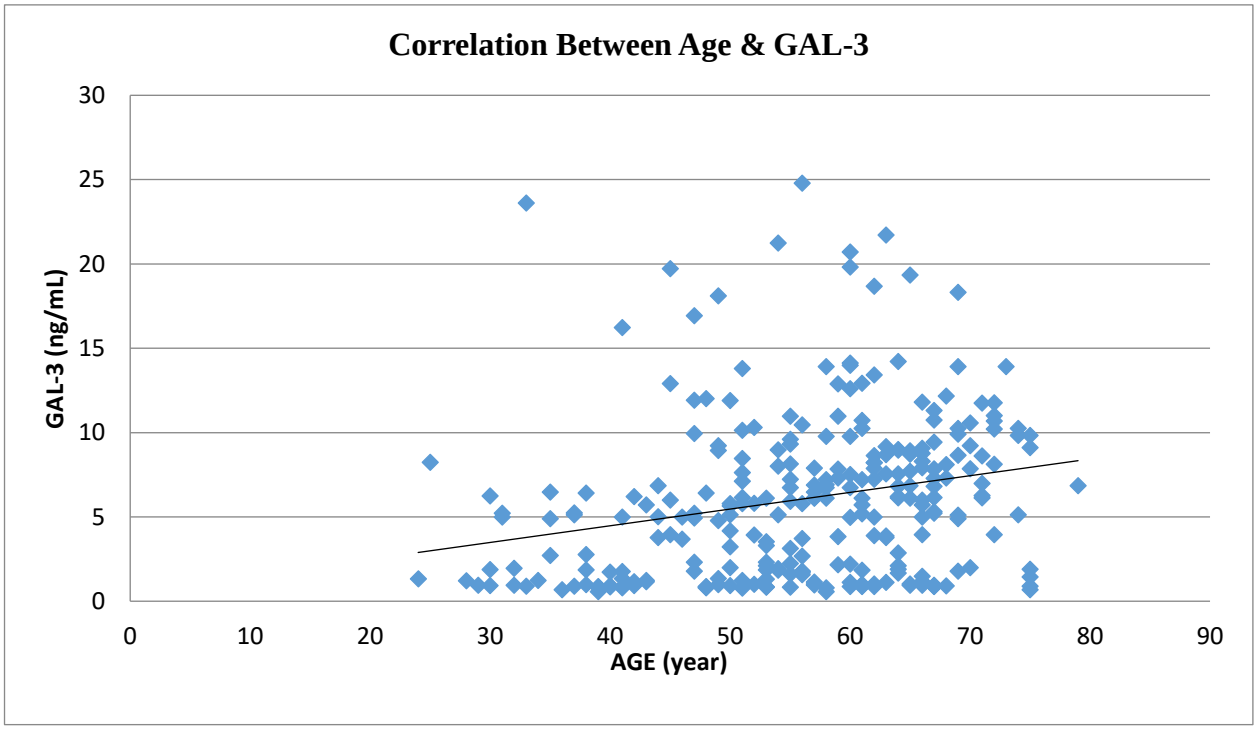

Fig.6 Correlation Between Age & GAL-3

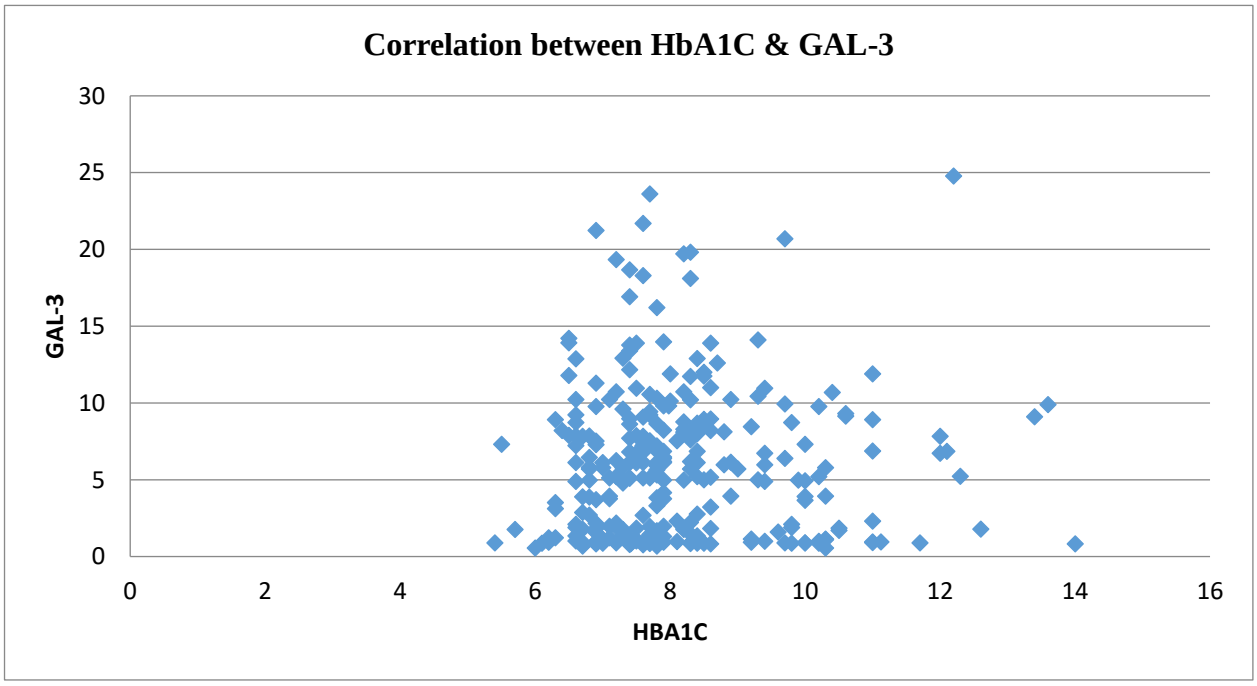

Fig.7 Correlation between HbA1C & GAL-3

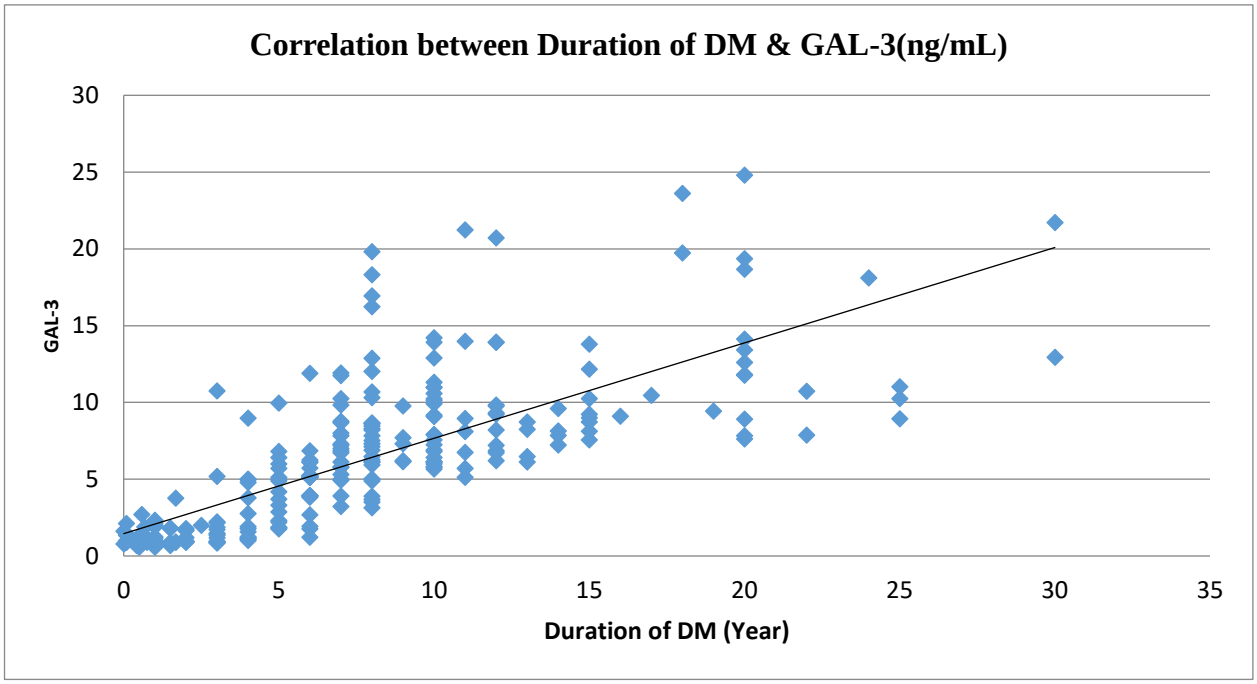

Fig.8 Correlation between Duration of DM & GAL-3(ng/mL)

RESULTS

Demographics and Biomarker Distribution

1. Gender Distribution:

- Sample size: 276 (45.3% males, 54.7% females).
- Mean age: Males (56.48 years), Females (55.70 years).

2. Key Biomarker Findings:

- Elevated HbA1C (>7%) was observed in 80% of patients, reflecting poor glycemic control.
- Galectin-3 > 6 ng/mL was elevated in 60%, highlighting potential cardiac fibrosis or remodeling.

3. Lifestyle Factors:

- 30% of patients were smokers, and 25% reported alcohol consumption.

4. Gender-Specific Findings

- BMI was significantly higher in females ($p < 0.0001$).
- Galectin-3 levels showed borderline significance, being higher in males ($p = 0.0583$).

5. Age Group Analysis

Significant differences were observed for:

- Duration of Diabetes (p = 0.0003): Older age groups had longer diabetes duration.
- Galectin-3 (p = 0.0081): Levels progressively increased with age.

6. Smoking and Alcohol Impact

- No significant difference in Galectin-3 levels between smokers and non-smokers (p = 0.9082 and p = 0.3700, respectively).
- Alcohol consumers had higher Galectin-3 levels (p = 0.0690, borderline significance).

CONCLUSION

This study underscores the importance of early biomarker-based screening for cardiovascular risk in T2DM patients. With 30% classified as high-risk, targeted interventions focusing on glycemic control and cardiovascular health are essential to reduce morbidity and mortality.The study reveals a high prevalence of moderate-to-high CVD risk among T2DM patients, driven by poor glycemic control and elevated biomarker levels. Galectin-3 provide valuable insights into cardiovascular stress and fibrosis, making it critical for risk stratification. While lifestyle factors like smoking and alcohol use contributed to risk, they were not as strongly associated as biomarker elevations.

Further Biomarkers like NT-proBNP, hsCRP, hsTrop I, hsTropT Combined with imaging techniques like Echocardiography or cardiac MRI can provide a more comprehensive assessment of cardiac health.

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